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AUTHOR Shennum, William A.; And Others
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ABSTRACT

Using time-compressed speech methodology, a program was developed which attempted to improve the reading rate and comprehension of U.S. Navy personnel with low reading ability. Four groups of trainees were tested. One group read training text while simultaneously listening to a speeded auditory version of the same text. A second group listened to speeded text without concurrently reading the material. The third group simply read material silently, with no auditory input. The fourth group was a control group which took pretests and posttests only. All groups except the control group showed sizable but comparable increases in unaided reading rate and comprehension performance. Thus, it appeared that the salient aspects of all procedures provided trainees with specific learning goals and precise feedback on their progress, coupled with teacher encouragement to improve. (Author)

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September 1975

USES OF TIME-COMPRESSED SPEECH IN A READING REMEDIATION PROGRAM: SOME EXPLORATORY TESTS

William A. Shennum
Edwin G. Aiken
Gary S. Thomas

Reviewed by
Earl I. Jones

Approved by
James J. Regan
Technical Director

Navy Personnel Research and Development Center
San Diego, California 92152

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Using time-compressed speech methodology, a program was developed attempting to improve reading rate and comprehension of Navy personnel with low reading ability. Four groups of trainees were tested. One group read training text while simultaneously listening to a speeded auditory version of the same text. A second group listened to speeded text without concurrently reading the material. The third group simply read material silently, with no auditory input. The fourth group was a control group which took pre- and posttests only. All groups except the control group showed sizeable but comparable increases in

unaided reading rate and comprehension performance. Thus, it appeared that the salient aspects of all procedures provided trainees with specific learning goals and precise feedback on their progress, coupled with teacher encouragement to improve.

FOREWORD

This research was performed under Exploratory Development Task Area PF55.522.002 (Methodology for Developing/Evaluating Navy Training Programs) and Work Unit Number PF55.522.002.03.30 (Exploratory Investigations and Tests of Innovative Procedures for Application in Navy Instructional Programs). This research tested the already developed technology of time-compressed speech in an innovative fashion, for possible use in Navy literacy training programs. Such uses of technology may be beneficial in cutting down the large amounts of individual attention which Navy instructors currently give to literacy trainees.

Appreciation is expressed to the entire staff at the Academic Remedial Training (ART) Unit, Recruit Training Command, San Diego, for their assistance at various stages of this research.

J. J. CLARKIN
Commanding Officer

SUMMARY

Problem

Underdeveloped reading skills are probable sources of failure and repeat rates in Navy training programs, as well as lowered on-the-job personnel effectiveness. The Navy and other military services have initiated reading remediation programs to help alleviate these problems. These programs require the development of increasingly effective methods, if the overall effort is to be cost-effective.

Approach

It is widely recognized that the ability to understand speech precedes the ability to read text. Reading, in fact, presupposes language abilities acquired early in life. A person who falls behind in reading skill development will have relatively better listening than reading abilities. Simultaneous presentation of written and spoken text should capitalize on this superiority of auditory over visual vocabularies to aid in developing more proficient reading skills. If it can be shown that controlling the spoken via the medium of time-compressed speech (TCS) results in raising the very slow reading rates characteristics of poor readers, then a promising technology is available. This study explored various uses of TCS in a Navy reading remediation program.

Findings

Students trained with TCS, both in listening and in simultaneous reading-listening, showed an increase in reading rate performance of about 60 wpm. Reading comprehension increased about 20%. In both training procedures, TCS support was systematically removed as training progressed, leaving students with increasing amounts of silent reading. Throughout training the students were given informational feedback on their performance and were encouraged to improve. Another group of students trained in a similar manner, but without TCS, showed increases in reading rate and comprehension comparable to the TCS groups. Finally, a control group taking only pre- and posttests showed no increases in rate or comprehension. Further evidence indicated that training effects may have been specific to the content of the reading material used in training. Precision goal setting and feedback appeared to be the critical elements in producing change.

Recommendations

The following recommendations for further research are made as the result of this study:

1. Determine the lowest reading rate(s) at which comprehension is unaffected. (pp. 15-16)

2. Investigate the introduction of TCS after students have mastered phonics and have reached their asymptotic unaided reading rate and comprehension. (p. 15)

3. Study the effect of varying reading material content during training to promote transfer of training effects. (pp. 10-12)

4. Test TCS in an environment uncontaminated by other concurrent remedial training. (p. 16)

5. In any reading rate program, assure that the student understands behavioral goals and his progress toward them, regardless of the training strategy employed. (pp. 7-10)

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INTRODUCTION

Problem

Many persons are unable to deal with the literacy demands of modern society (Harman, 1970). Despite years of research on reading, underdeveloped reading skills remain a probable source of failure in school and on the job (Sticht, Caylor, Kern, & Fox, 1972). Failure rates, as well as repeat rates, in military training programs are costly (Larkin, 1973). Two approaches for solving this problem are available: (1) attempt to lower the reading levels required in training or (2) attempt to raise the reading skills of the personnel. The Navy and other military services have attempted to solve the problem using both approaches. For example, the reading remediation program at Recruit Training Command, San Diego, though limited to a duration of several weeks, has been shown to be effective in increasing reading ability up to an equivalent of about two grade levels (Duffy, Nugent, Millar & Carter, 1974). However, increasingly efficient means of remediating deficiencies are continuously being sought.

Background

Theory

After phonic skills and adequate vocabulary have been acquired, increased reading rate and reading comprehension become the target behaviors in most reading programs. Slow rate is usually given less attention than poor comprehension, although there are good theoretical reasons for believing they are related. Excessively slow as well as excessively fast reading rates may be important sources of poor reading comprehension. Thus remediation programs which emphasize decoding skills and vocabulary may tend to slow readers down. Readers may not be aware of the fact that each word need not be decoded to allow comprehension of the main ideas.

We hypothesized that if a reader's baseline (i.e., typical) reading rate is well below normal conversational rates (125-175 wpm), it is probably too low to allow for adequate reading comprehension since such comprehension largely depends upon contextual cues from earlier material. At very slow rates, any given bit of contextual information will be more distant in memory. Thus, the extent to which the total message is comprehended probably will be reduced. Therefore, we designed an approach to reading training which emphasized comprehension skills, as they may have been limited by the memory requirement inherent in very slow reading rates.

It is well established that although most adult remedial readers have poor reading histories, they do have at least adequate to average auditory language abilities. Since learning to read is based upon auditory abilities (Sticht, Beck, Hauke, Kleiman, & James, 1974), it seemed wise to directly involve these already-developed abilities in reading training exercises. Mechanical devices traditionally used in reading rate training are visually-oriented, and do not draw upon auditory abilities. However, time-compressed speech (TCS) provides a reading-pacing technology that does make use of the student's auditory capabilities.

Time-Compressed Speech

Research on TCS and its applications (see Duker, 1974, for review), began appearing about 20 years ago, although little attention has been paid to TCS as a potential aid to reading improvement. The single published study on this topic (Thames & Rossiter, 1972), yielded positive evidence that high school students who read while simultaneously listening to a series of passages (compressed to rates from 150 wpm to 350 wpm) increased their reading rates significantly more than students who merely read the same passages. It should be noted, however, that both groups of students increased in rate from pre- to posttest. Neither group changed significantly with respect to reading comprehension. In this study, TCS was used as a pacing mechanism. Simultaneous reading-listening at speeded rates was interpreted as enabling the students (who, not being remedial readers, were presumably about equal in visual and auditory language abilities) to process more chunks of information per unit of time during training. This, in turn, was assumed to account for the transfer to their unaided reading rate.

However, reading while listening to TCS may have its effect in quite a different way. It may simply allow the students to experience faster rates with increased comprehension. This effect, combined with precise objectives, detailed feedback on progress toward objectives, and teacher encouragement, could have resulted in the higher unaided reading rates.

An Exploratory Test Program

It was speculated that, in a remediation population possessing relatively superior auditory over visual language abilities, low reading rates, as well as inadequate comprehension strategies due to low rates, might be altered with TCS. We chose to explore various compressed speech techniques within a Navy reading remediation program in a way which intruded only minimally on the school's daily instructional routine. Further, we decided to give a few students many hours of training, rather than give many students only a few hours so that the training procedures could show maximum effect.

METHODS AND RESULTS

Subjects

The trainees were 26 recruits at the Academic Remedial Training (ART) Unit, Recruit Training Command, San Diego. Trainees were in their last week of the ART Unit's 3-to-6 week program, and thus were assumed to have acquired their basic phonic skills. Our experimental training was predicted to be of greatest value to those who possessed basic phonic ability. In reading ability, students were at approximately the 5th or 6th grade achievement level.

The trainees were assigned to four groups. The first group (N = 9) read training text while simultaneously listening to a speeded auditory version of the same text. The second (N = 5) listened to speeded text without concurrently reading the material. The third (N = 7) simply read material silently, with no auditory input. The fourth (N = 5) was a control group who took pre- and posttests only.

Training Materials

Sizeable amounts of training material were needed. A 40,000-word popular novel was selected, based on interest value, from the ART Unit's library. The FORCAST readability formula (Caylor, Sticht, Fox & Ford, 1973) indicated that the book was at about the 8th grade level of difficulty. Material was purposely selected which was several grade levels above the trainees' reading level, both to provide an ample margin for improvement, and to present words that would likely be in their auditory but not visual vocabularies. In addition, two 1000-word short stories were obtained from a separate source. This material, used in pre- and post-testing, was equal in readability to the training text.

The training text was reproduced and divided into 40 1000-word segments. The segments were recorded on audio cassette tapes at a speaking rate of 150 wpm. Tapes were played on a Lexicon speech compressor/expander with a range of rates from 75 to 375 wpm.

General Procedures

To accommodate individual differences in the trainees' baseline silent reading rates and preferred degree of speech compression, training was individualized. It took place during a specified 2-hour period on 6 consecutive class days. Trainees worked through the entire 40,000-word novel.

The baseline reading rate for the novel (Baseline 1) was determined initially from two unpaced text segments. Reading comprehension on these and all subsequent training segments was measured by means of Modified

Cloze tests.[1] An additional baseline measure of reading rate was taken on one of the unrelated short stories (Baseline 2). Multiple-choice tests were the measures of comprehension on the short stories. Training began after baselines had been measured. Several varieties of training were explored.

After training, two transfer tests were administered to determine training effects. A 5,000-word criterion text passage from the novel, with a comprehension test over the last 1,000 words, served as a length transfer test. This extended reading task was thought to be a more realistic test of the training's effectiveness than that provided by the much shorter passages used during training. A 1,000-word unrelated short story, with a multiple-choice comprehension measure, served as a content transfer test.

Group Training Procedures

Reading-Listening Group

Nine trainees were assigned to the reading-listening group. Given the students' generally superior listening over reading ability, the initial rate at which a trainee could simultaneously read and listen to discourse should be some amount greater than his baseline reading rate. Also, as he becomes accustomed to compressed speech at faster rates, the preferred reading-listening rate should increase accordingly, up to some maximum rate. Trainees selected an initial rate as they simultaneously read and listened to a practice segment. Specifically, they were instructed to increase the speech compressor rate to the maximum point where they were able to comprehend the vocal input and still keep up with the visual pace. The student set rate was used in training until the trainee was able to tolerate faster rates, at which point it was increased.

Instead of having trainees read-listen to 100% of each training segment, instructors progressively reduced the percentage of the training passages which were accompanied by audio. This general procedure, referred to in learning research as "fading," was adopted to maintain the trainees' attention and to prevent them from listening only. Trainees began with 100% of the segment accompanied by audio and then moved to conditions

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[1] Ten sentences, distributed equally throughout the segment, were selected and listed. From these, every other noun was deleted. The deleted nouns, plus four distractor nouns, were alphabetically listed and numbered at the bottom of the page. Students answered items by placing the appropriate number in the blank space. A 10-minute time limit was observed.

where only 90%, 80%, . . . 40% was accompanied. The instructor accomplished this by stopping the speech input after 90%, 80%, etc. of the segment had been played. Trainees were instructed to read the remaining 10%, 20%, etc. on their own at a rate as near as possible to the paced rate. Three drills at each percentage level from 100% to 40% were given, with one unpaced test segment separating drill trios. Feedback on progress and encouragement to improve were given throughout. When they completed the training drills, the length transfer test was administered to determine training effects.

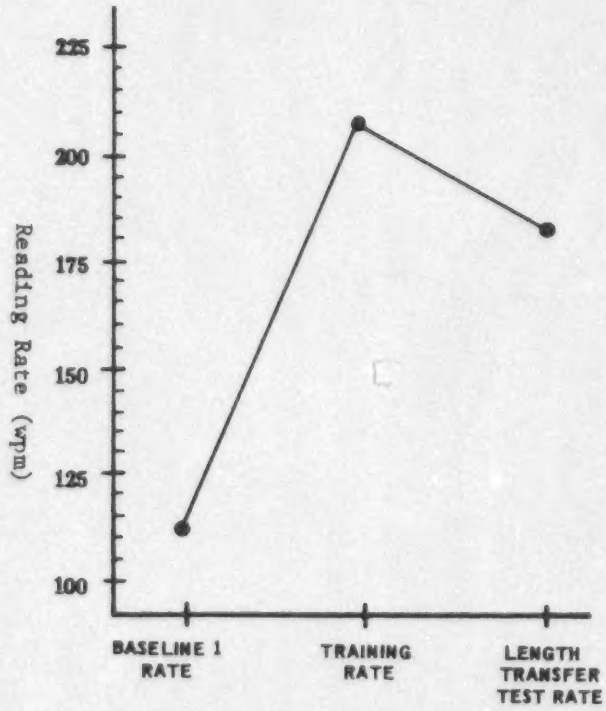
Figure 1 shows the performance of the reading-listening group. The length transfer test reading rate was about 70 wpm higher than the baseline rate (Figure 1a), and test comprehension was about 25% higher than the baseline (Figure 1b). However, the training rate (i.e., paced reading rate) was double the baseline rate, and comprehension on training passages (paced portions) was likewise nearly twice the baseline comprehension. Compared to training performances, the transfer test rate declined about 30 wpm, while test comprehension declined about 2%.

It is apparent that inclusion of the auditory version of the text, though speeded, did enhance the trainees' understanding of the message. Although reading rates and comprehension across all drills were condensed to two data points in the figures shown, it should be mentioned that rates increased gradually while comprehension increased initially and then leveled off.

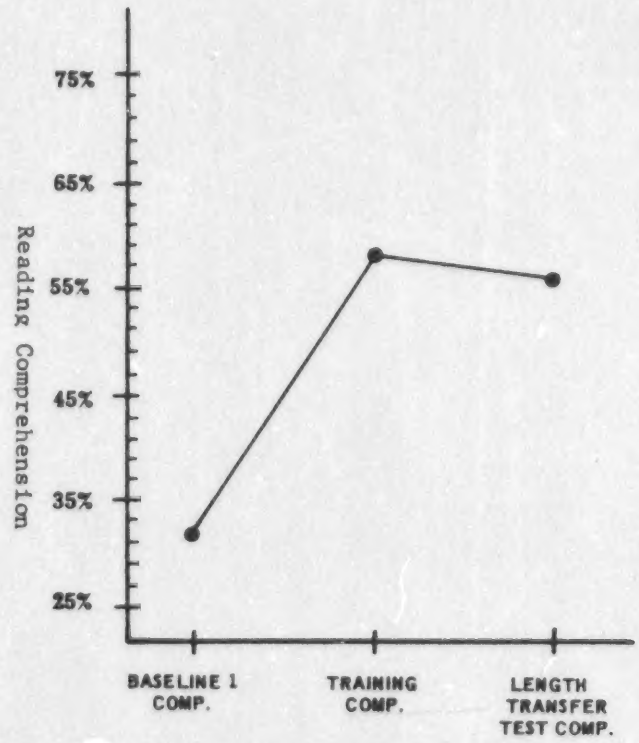
Our interpretation at this point was that, while simultaneously reading and listening with TCS, the student experienced a faster comprehension rate, plus practice in eye-movement behavior at that rate, and that the fading strategy resulted in transfer to the unaided test passage. However, we wondered whether the listening component during drills, or the combination of reading and listening, had been the main contributor to the reading gains observed. If auditory pacing simply served to enhance comprehension skills, without any gain in eye-movement efficiency, then training students in high rates of listening only should be equally effective. To address this issue, the second group (N = 5) was trained with TCS, but was <u>not</u> permitted to read and listen simultaneously.

<u>Listening-Only Group</u>

The listening-only group (N = 5) was trained in the same manner as the reading-listening group, except that these trainees did not read while they listened to the compressed speech version of the text. Again, auditory training passages were "faded." Trials were structured such that trainees listened to some text, the experimenter stopped the tape at the appropriate point, and the trainees immediately began reading the remainder of the passage at a rate as near as possible to the paced



1a. Training effect on reading rate.



1b. Training effect on reading comprehension.

Figure 1. Performance of Reading–Listening Trainees (N=9).

rate. On completion of training, the length transfer test was administered. Figure 2 shows the performance of these trainees, plotted with that of the previous group.

Increases in performance from baseline to transfer test passages were again evident: About 50 wpm in rate (Figure 2a) and 10% in comprehension (Figure 2b). Performances of the two TCS groups on the length transfer test were nearly identical, although gain scores for the listening group were smaller, due to higher baselines. The listening group tended to show larger transfer decrements between training and test performances than the faded reading-listening group. As before, performances were averaged for economical display. It will be simply mentioned that, in the speeded listening only group, both reading rate and comprehension increased early in training, and then leveled off.

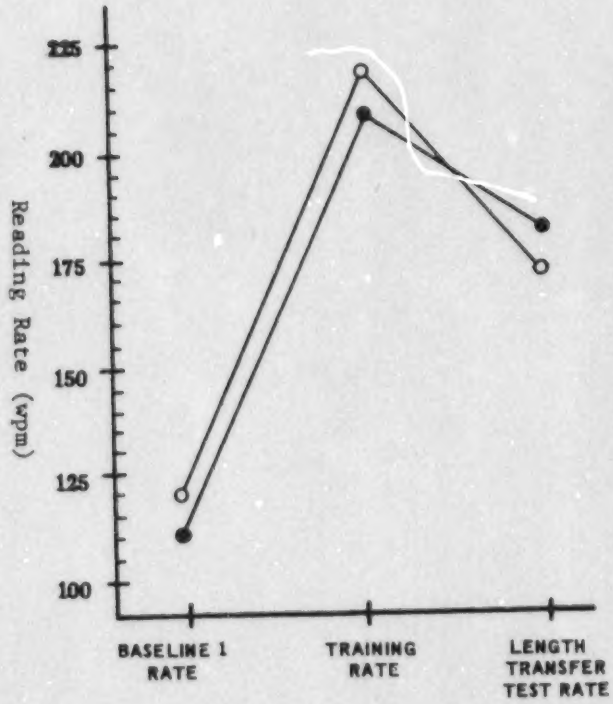
Taken together, the small differences between groups shown in Figure 2 are less striking than the overall similarities in performance. After training both groups increased substantially in reading rate and comprehension. This suggested to us that the audio component was the critical feature to reading improvement, whether or not the text was read in parallel.

Both groups of students had been exposed to TCS, had received feedback on their progress, and were given encouragement to increase both their rate and comprehension. We wondered whether exposure to TCS was even required, and how trainees would perform if they simply read the training text and were provided with only feedback and encouragement. To answer this question, the trial group (N = 7) proceeded through the training material with no audio input.

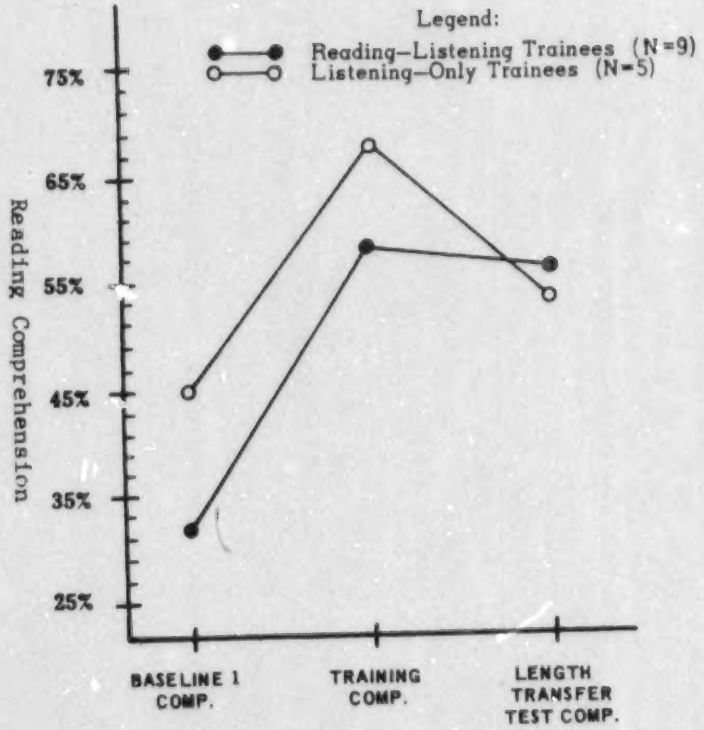
Reading-Only Group

Seven students read all training material silently and were told periodically how their reading performances compared with their baseline performances. Emphasis in the instructions was placed upon the learning benefits of practice reading, and trainees were encouraged to improve their reading as best they could. After they finished reading the material, the length transfer test was administered. Figure 3 shows the performances of the reading-only group, plotted with those of the previous groups.

Again, performance increases in both reading rate and comprehension resulted from training. The test rate was 60 wpm higher than the baseline rate (Figure 3a) and comprehension increased 26% (Figure 3b). Results closely resembled those of the two TCS aided groups, except that reading rate on training trials was lower since the training was self-paced. Defining training goals and giving trainees encouragement and feedback on their progress led to increased final reading performances. It appeared that including compressed speech

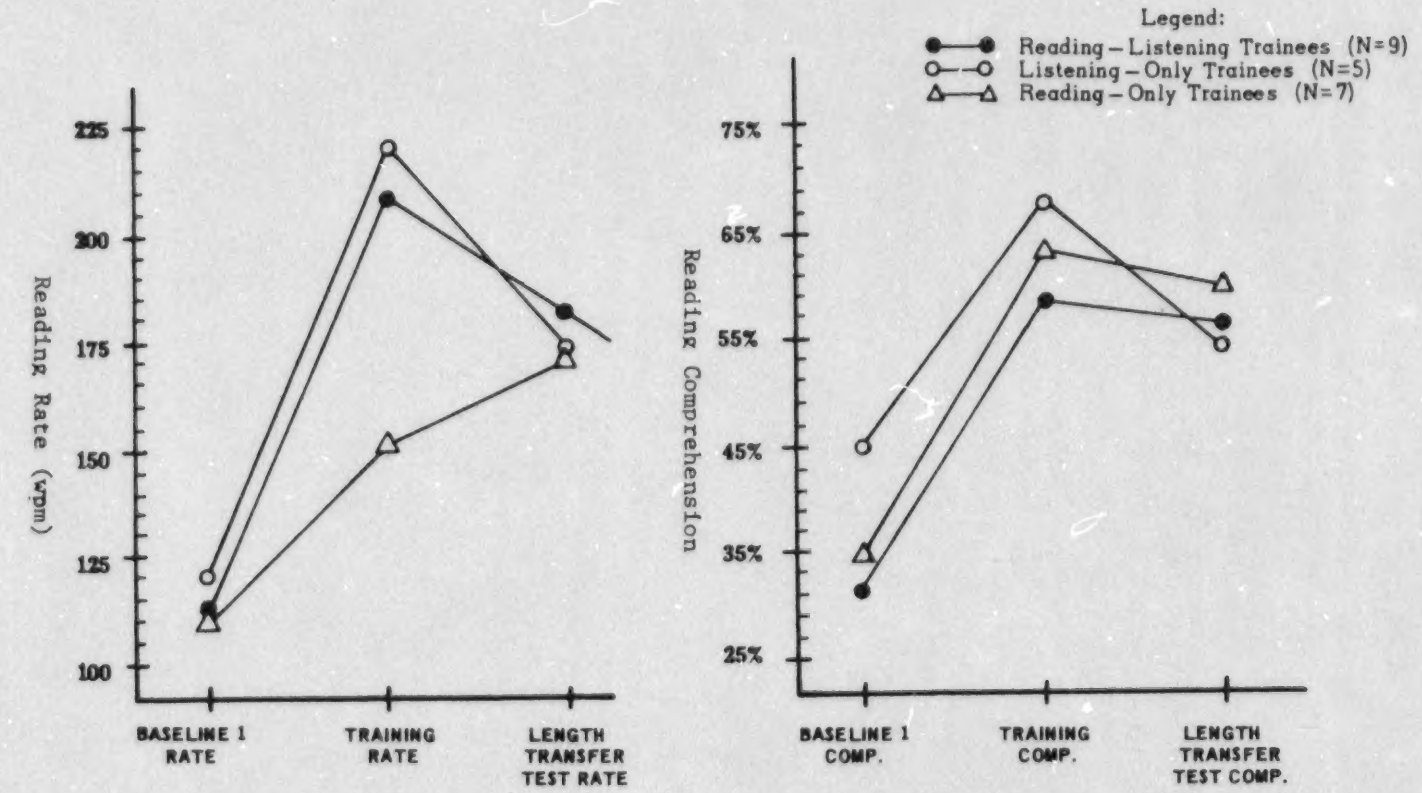


2a. Training effect on reading rate.



2b. Training effect on reading comprehension.

Figure 2. Comparison of Reading–Listening and Listening–Only Trainees.



3a. Training effect on reading rate.

3b. Training effect on reading comprehension.

Figure 3. Comparison of Reading – Listening, Listening – Only, and Reading – Only Trainees.

added little beyond what was provided by carefully monitoring trainee performance and providing encouragement from the examiner.

Control Group

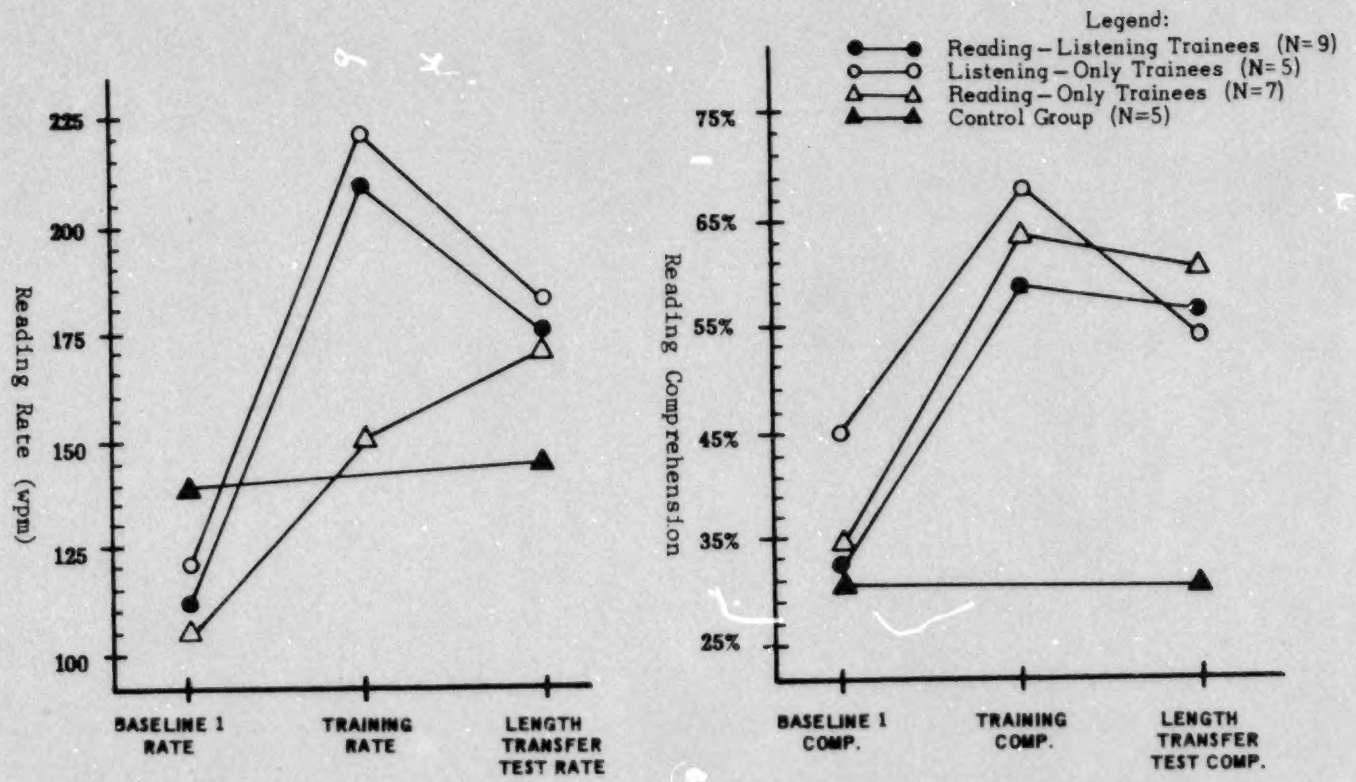
At this point we reassessed the study for a period of time. Three seemingly different training strategies resulted in comparable reading performance increases over the 1-week interval between pre- and post-training. The three features apparently common to all training strategies-goal-setting, feedback, and encouragement-were assumed to have been responsible for the performance gains observed. It did not seem worthwhile to explore further the sources of training effects. For example, we might have set up training groups who were given encouragement only, or those who were given precise goals but no feedback on progress, etc. However, such efforts were unpromising, and would still not have eliminated the possibility that performance gains may have been due to pre- and post-testing effects and/or other ongoing reading remediation. For such reasons, a fourth group (N = 5) was run as a control for testing effects only. This group simply received the pre-and post-tests, with no special training during the testing interval. Results obtained by this group are shown in Figure 4, along with those of all previous groups.

The fact that virtually no change in either reading rate or comprehension was noted for the control group cancelled out, to our satisfaction, the possibility that observed gains may have been due to testing or other remedial training effects. Thus, our conclusion was that precise specification of goals, feedback on trainee progress, and encouragement to improve were the effective elements of training was reinforced.

Reading Unrelated Material - Content Transfer Test

As indicated previously, training materials consisted of a training text (a 40,000 word novel) and two short stories. The stories were equal in difficulty to the training text, but entirely different in content. An additional baseline measure of reading rate and comprehension (Baseline 2) was taken on one of the short stories.

All trainees read one of the short stories before training. After training, they read the other short story and were administered a multiple-choice comprehension test, which served as a content transfer test. The question of interest was to determine to what degree, if any, training on a given set of reading matter (the training text) would affect trainees' abilities to read and comprehend unrelated material of equal difficulty.

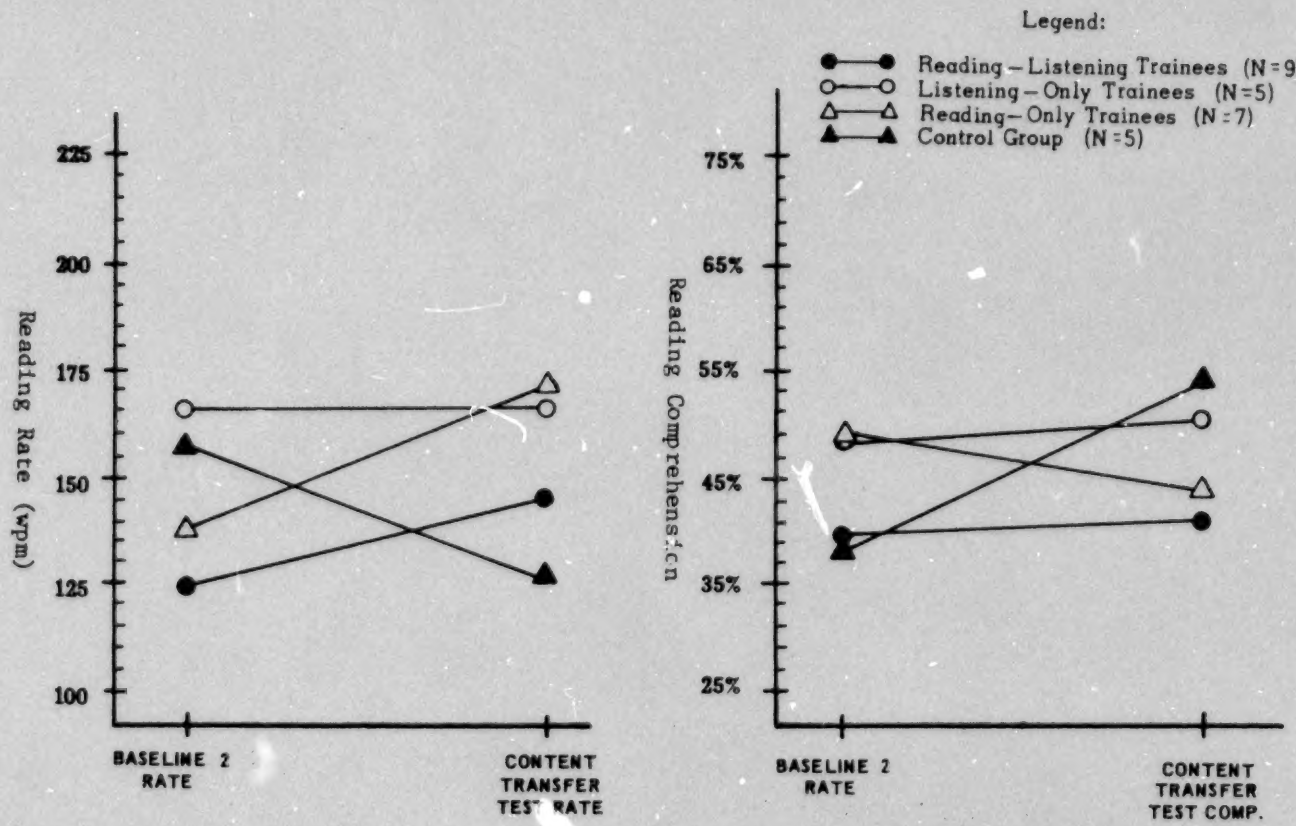


4a. Training effect on reading rate.

4b. Training effect on reading comprehension.

Figure 4. Comparison of Performance of Reading – Listening, Listening Only, Reading – Only, and Control Trainees.

Results for all groups are shown in Figure 5. Although reading rate increased for the reading-only trainees, comprehension declined to a comparable degree, indicating little overall improvement. The opposite trend occurred for the control group. The reading-listening trainees experienced an increase in reading rate, but no change in comprehension. Abilities of listening-only trainees remained the same. Training effects thus seemed to be specific to the particular materials and comprehension tests used in training. This suggests that the gains we observed in reading performance did not reflect improvements in the trainees' general reading ability. Rather, they indicate improved ability to deal with a given body of prose--the training text.



5a. Training effect on reading rate.

5b. Training effect on reading comprehension.

Figure 5. Performance of Trainees on Unrelated Reading Material.

GENERAL DISCUSSION

A most striking feature of our results was that several training variations led to comparable final reading rates and reading comprehension. No change occurred for the control group. Three seemingly different approaches to training yielded rate increases of about 60 wpm and comprehension increases of about 20%. Usage of compressed speech, whether trainees read while listening or simply listened, proved effective when progressively replaced with silent reading. However, simply reading the training material silently proved equally effective. All in all, the salient features of all procedures seemed to be providing trainees with specific learning goals and precise feedback on their progress, coupled with encouragement to improve their reading.

The finding that training appears to improve trainees' ability to deal with similar material but not with material different in content suggests two implications. First, varying material content during training might be an effective way to increase reading abilities. Second, if training goals are to increase reading performance on a given body of prose (e.g., a technical manual), then using that prose as training material is advised. It would seem that any reading remediation program should not only try to raise trainees' general reading abilities, but should also include efforts to familiarize them with specific reading matter they will be expected to use after training.

The finding that training without TCS was as effective as training with TCS seems contradictory to the idea that TCS methods should capitalize on the remedial reader's superior listening over reading abilities. However, the following constraints on this study's conclusions should be recognized before the usefulness of TCS is dismissed.

1. The small number of trainees associated with this exploratory study necessarily limits the reliability of the findings. There is always a question as to whether replication of the study would yield similar findings.

2. Although it was assumed at the outset of TCS training that trainees possessed an adequate phonics ability, they may have still been experiencing difficulties in this regard. Further, if their phonics ability was still inadequate, the students may not have reached their asymptote of unaided reading rate and comprehension prior to training.

3. It was assumed that TCS would be most effective when baseline reading rates were too slow to allow adequate memory storage of

contextual information. Baseline rates may have been above this critical minimum for the particular training materials used. This is an interesting and unanswered empirical question.

4. Compressed speech trainees may have benefited along some dimension not tapped by the before-after training measures. Theoretically, these trainees may have improved in listening ability, sight vocabulary, or other linguistic areas not specifically measured.

5. The fact cannot be ignored that all trainees were assigned to the ART Unit, and were exposed to hours of reading instruction daily. The sheer amount of classroom and other learning experiences may have equalized trainees, such that 12 hours of experimental intervention could not override this larger instructional impact. Although our control procedures attempted to minimize this possibility, entirely different results might emerge from a population receiving no other forms of reading instruction.

If precise goal setting, feedback on progress, and teacher encouragement were indeed the effective aspects of all training, then remediation programs should direct more attention to these variables. The poor reader's school history may have been characterized by failures, either by academic marks, or by falling progressively behind his school peers. He may have been given much general negative evaluation but little accurate informational feedback about his particular reading weaknesses or strengths. Such a student could learn to expect himself to fail at reading tasks, and might anticipate a lack of success even when trying his hardest to succeed. These factors certainly wouldn't benefit his ability to deal with the reading task.

If simple teacher feedback and encouragment, or novel procedures such as compressed speech exercises, can alter the remedial reader's self-expectations and/or increase his attention and motivation, then learning may follow. Further studies would do well to look into various ways of changing these negative expectations to promote successful reading achievement.

CONCLUSIONS

Although this investigation was limited in sample sizes, some general conclusions still emerge:

1. There are several ways that reading students may be prompted to read faster. Data obtained in this study suggest that this can be done both with TCS techniques and/or precise specification of goals and progress. Other mechanical devices are available, most notably visually-oriented pacers. However, if an aiding device is used, TCS would seem advantageous since it builds upon the student's previously developed auditory language skills.

2. Methods for increasing reading rate do not necessarily lead to reduced comprehension of the material. In fact, students exposed to speeded auditory discourse show equal or better than usual comprehension. When the auditory support is removed, performances drop, but not back to the baseline level. This may be particularly (or primarily) true when the grade level difficulty of the material is above the student's reading grade achievement level and when reading ability is low. The similarity in performances of the three training groups raises serious questions as to whether the TCS technology is actually required. Investigations of TCS after other methods have led students to their asymptote performance are indicated.

3. The gains in reading rate and comprehension due to training apparently did not lead to improvements in trainees' general reading abilities. Had these gains represented general learning effects, more content transfer would have emerged. Varying training material content might be an effective strategy for promoting transfer or, if increased reading performance on a given body of material is the training goal, then training on that material would seem desirable.

4. The way the teacher verbally responds to the reading student is probably a very important aspect of training, especially in the case of adult poor readers. Their particular learning histories at school could well result in low self-expectations in regard to reading. If true, profitable training results should follow positive changes in these expectations. Ways to promote such changes are to give the student manageable reading tasks, nonevaluative informative feedback on his task performance, and encouragement aimed at maintaining at his motivation to learn.

RECOMMENDATIONS

The following recommendations for further research are made as the result of this study:

1. Determine the lowest reading rate(s) at which comprehension is unaffected.

2. Investigate the introduction of time-compressed speech after students have clearly mastered phonics, and have reached their unaided asymptotic rate and comprehension.

3. Vary the reading material content during training as a possible means for increasing content transfer.

4. Test time-compressed speech methodologies in an environment uncontaminated by other ongoing remedial instruction.

5. In any reading rate program, regardless of the training procedure employed, assure that the student clearly understands the learning objectives and his progress in reaching them.

REFERENCES

1. Caylor, J. S., Sticht, T. G., Fox, L. C., & Ford, P. J. Methodologies for Determining Reading Requirements of Military Occupational Specialties. (HumRRO Technical Report 73-5). Alexandria, Va.: Human Resources Research Organization, March 1973.

2. Duffy, T. M., Nugent, W. A., Millar, D. B., & Carter, J. F. Assessment and training of essential skills. Paper presented at Navy Technical Manual Systems (NTMS) Program Review, San Diego, December 5, 1974.

3. Duker, S. Time-compressed speech: An anthology and bibliography in three volumes. Metuchen, N. J.: Scarecrow Press, 1974.

4. Harman, D. Illiteracy: An overview. Harvard Educational Review, 1970, 42, (2), 226-243.

5. Larkin, T. Peer teachers: More than equal. Manpower, 1973, 5 (8), 15-21.

6. Sticht, T. G., Beck, L. J., Hauke, R. N., Kleiman, G. M., & James, J. H. Auding and reading: A developmental model. (AFHRL Tech, Rep. 74-36). Alexandria, Va.: Human Resources Research Organization, July 1974.

7. Sticht, T. G., Caylor, J. S., Kern, R. P., & Fox, L. C. Project REALISTIC: Determination of adult functional literacy skills. (HumRRO Professional Paper 20-72). Alexandria, Va.: Human Resources Research Organization, September 1972.

8. Thames, K. H. & Rossiter, C. N. The effects of reading practice with compressed speech on reading rate and listening comprehension. Audiovisual Communication Review. 1972, 20 (1), 35-42.

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